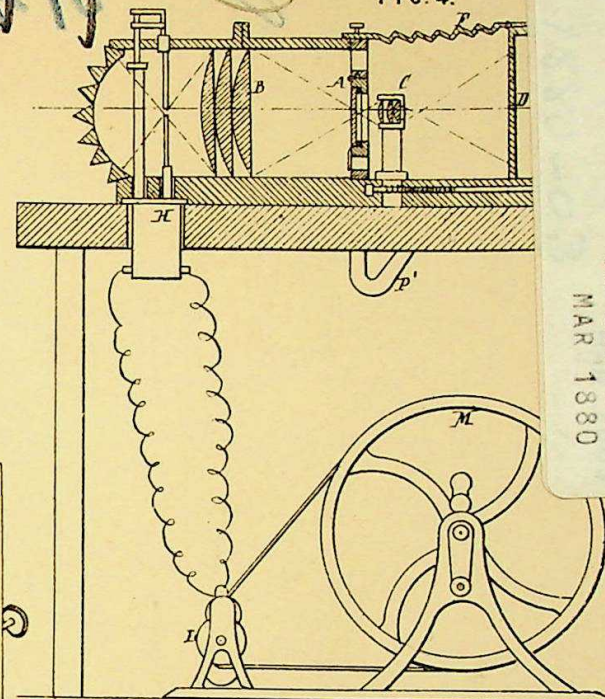
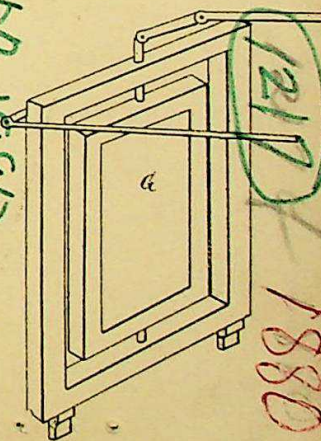


FIG. 4.



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FIG. 8.



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FIG. 6.

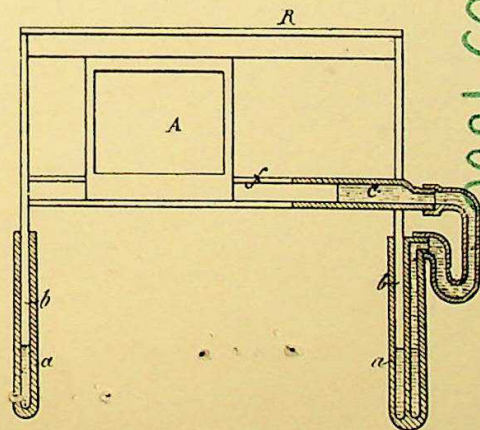


FIG. 3.

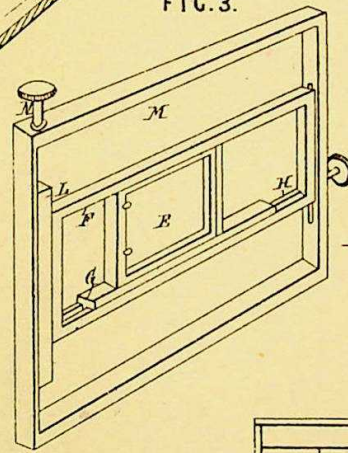


FIG. 2.

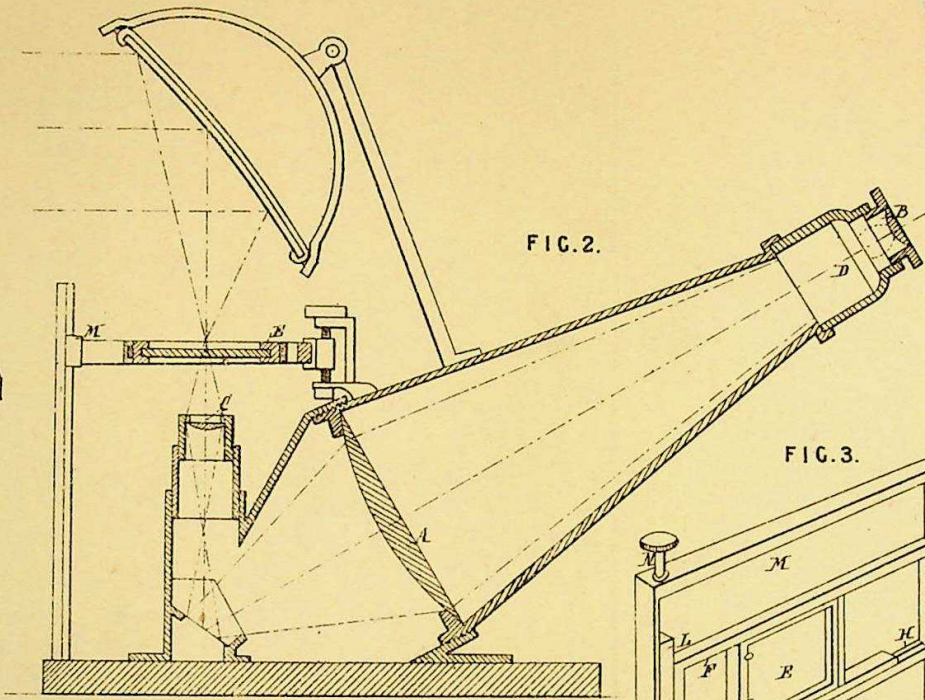


FIG. 7.

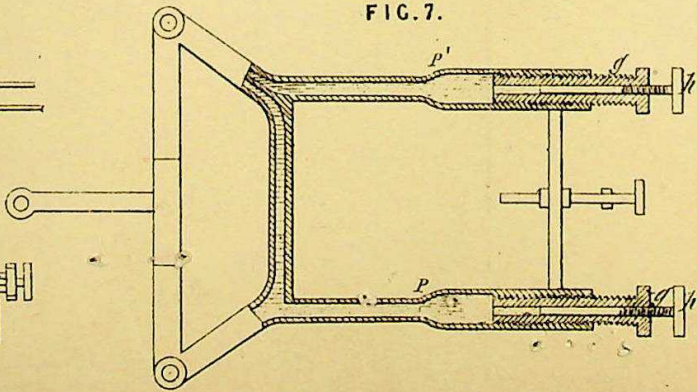


FIG. 5.

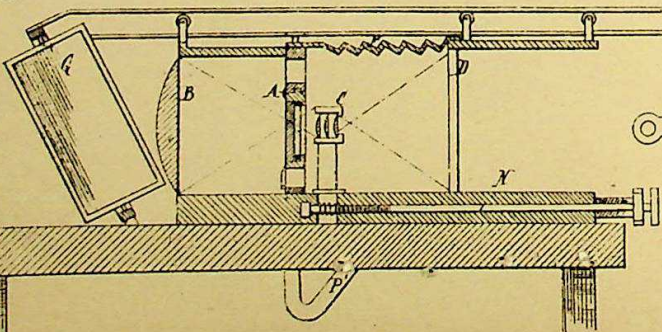
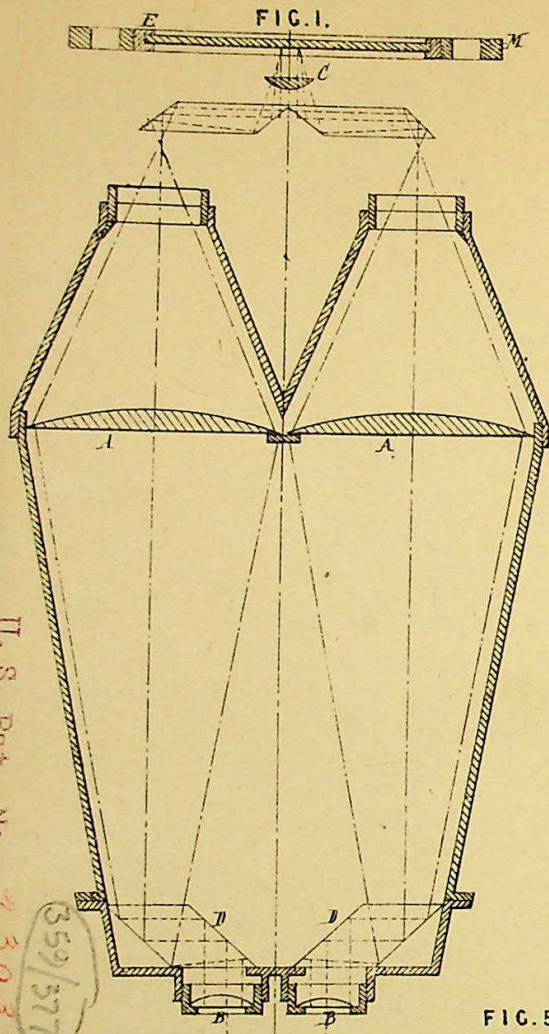


FIG. 1.



A.D. 1880, 20th MARCH. N° 1217.

Apparatus for Examining Microscopic Photographs.

LETTERS PATENT to William Robert Lake, of the Firm of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London, for an Invention of "IMPROVED APPARATUS FOR FACILITATING THE READING OR EXAMINATION OF MICROSCOPIC PHOTOGRAPHS OF WRITTEN OR PRINTED DOCUMENTS, PICTURES, STATUARY, NATURAL OBJECTS, OR THE LIKE." A communication from abroad by Eusebius J. Molera and John C. Cebrian, both of San Francisco, California, United States of America.

PROVISIONAL SPECIFICATION left by the said William Robert Lake at the Office of the Commissioners of Patents on the 20th March 1880.

WILLIAM ROBERT LAKE, of the Firm of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London. "IMPROVED APPARATUS FOR FACILITATING THE READING OR EXAMINATION OF MICROSCOPIC PHOTOGRAPHS OF WRITTEN OR PRINTED DOCUMENTS, PICTURES, STATUARY, NATURAL OBJECTS, OR THE LIKE." [A communication from abroad by Eusebius J. Molera and John C. Cebrian, both of San Francisco, California, United States of America.]

This Invention is more especially intended to provide means whereby an observer can easily read or examine matter previously reduced to a microscopical scale by the photographic apparatus described in the Specification accompanying my petition for Letters Patent, filed this 20th day of March 1880, No. 1216.

The first part of the present improvements relates to the optical construction of a binocular microscope, and also to the plate holder employed in presenting to the objective glass the plate having upon it the reduced matter.

This part of the said Invention comprises the combination with eye lenses and large field lenses, of two intermediate prisms located next to the eye lenses, and adapted to bring the two separate images nearer together; also the combination with a frame in which a plate-holder and its slide are adapted in such a manner as to have independent or joint movements of an enclosing frame in which said plate-holder-frame and its slide are adapted to have independent or joint movement, said parts being adapted to permit the plate holder to be adjusted vertically and horizontally by both quick and slow movements.

[Price 6d.]

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The second part of the present improvements relates to the means employed in adjusting the holder which maintains in position the plate containing the microscopic matter, and to other features hereinafter described.

This part of the said Invention comprises the combination with one or more light-condensing lenses and a plate holder of one or more microscopic lenses and a transparent screen, said parts being enclosed in a tubular case, and provided with a screw shaft extending rearward, whereby the observer may adjust the plate-holder relatively to the microscopic lens; also the combination with one or more light condensing lenses, a plate holder, and one or more microscopic lenses, of a transparent screen, and a magnifying lens, said parts being connected and enclosed in a tubular case; also the combination with two tubes adapted to be filled with liquid and provided with upright-cylinders, a horizontal cylinder connected with one of said tubes, and devices for adjusting the liquid in the tubes, of a frame having depending pistons which work in the upright cylinders, and a plate holder having sliding movement in said frame and provided with a piston which works in the horizontal cylinder; also the combination with a vertically adjustable frame having a horizontal cylinder and a plate holder provided with piston working in the cylinder of a tube adapted to be filled with a liquid, a liquid adjusting device, and a flexible pipe which connects said tube with the cylinder; also the combination with two tubes adapted to be filled with liquid and having upright cylinders, and a plate holder frame provided with depending pistons which work in the cylinders of tubular screw plugs fitted in said tubes, and small screw plugs fitted in the tubular screw plugs, whereby the liquid in the tubes may be adjusted quickly or slowly.

In carrying the said Invention into practice the two eye lenses are made of large diameter and with comparatively short focal distances; their distance from the objective glass is such as to cause a large field of vision. The large size of the field lenses has the effect of forming two separate images at such a distance from each other that it is impossible to simultaneously view the objects with both eyes. I therefore place two prisms between the object lenses and eye lenses, and near to the latter. Each prism inclines laterally inward from its end nearest the field lens to its end nearest the eye lens, so that the pencils of light which come from the field lens strike the outer side of the prism and are deflected inwardly against the opposite side of the prism, and are thus brought in line with the eye lens. In this manner the two separate images are brought sufficiently near together to permit the observer to simultaneously use both eyes. The plate-holder is adapted to have sliding movement in a frame either independently of or jointly with its slide, the latter being moved by means of a screw thread on a spindle which permits the slide to be adjusted to and fro as desired. This plate holder frame is itself provided with a slide, and is adapted to be moved in an inclosing frame either independently of or jointly with its slide. Another spindle is provided having also a screw thread, by means of which the latter slide is worked; by grasping the plate holding frame with his hand the observer may quickly adjust the plate holder vertically. If a slow vertical adjustment is desired, it is obtained by operating the spindle which moves the plate holder frame slide, carrying this frame up and down in the outer frame. If a quick horizontal adjustment of the plate holder is desired, the latter may be moved by hand to any desired point in the inner frame; if however a slow horizontal movement is desired the observer operates the first named spindle in connection with the slide carrying the plate holder. It is thus apparent that the plate holder may be adjusted vertically and horizontally by both quick and slow movements.

The transparent plate which contains the microscopic matter is placed in a plate holder; the light from any suitable source, condensed by a proper deflector and one or more condensing lenses, passes through this plate, and the pencils of light from the latter pass through one or more microscopic lenses. An enlarged image is thereby projected on a transparent screen which is provided for the purpose, and said image is still further enlarged by one or more magnifying lenses. A tubular casing rigid or elastic encloses the several parts of the instrument, and protects

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them from exposure to exterior light, so that the image on the screen may be plainly seen. The observer is able to read the plate without placing his eyes close to the instrument, and without being obliged to look through a small hole or holes. In fact, it is not necessary to employ any of the magnifying lenses just mentioned, and where they are omitted the observer looks directly at the transparent screen.

5 In a modified form of light condensing apparatus I provide a heliostat furnished with means which adapt it to be operated from the observer's seat. When the plate is not transparent the light and light condensing apparatus have to be placed in front of the plate holder. In some cases natural daylight will be sufficient, and
10 the light condensing apparatus may be suppressed. In the case of using an electric light, the same may be connected with an electric machine operated by a driving wheel, which latter is actuated by the feet of the observer. The plate holder is adapted to be adjusted relatively to the microscope lens or lenses by a screw shaft which extends rearward to be operated from the observer's stand. The plate holder
15 is also adapted to be operated by the observer without leaving his position, and two rates of movement are provided for, one being for a quick and the other for a slow adjustment of the plate holder. Two tubes adapted to be filled with liquid extend lengthwise of the instrument, and have their forward portions formed as upright cylinders; in the latter there are pistons which depend from a vertical frame, the
20 lower longitudinal portion of which is formed with a horizontal cylinder. This cylinder is connected with one of the tubes by the flexible pipe which permits of the independent vertical adjustment of the frame which supports the plate-holder. The upper and lower portions of this plate holder slide in grooved ways formed in the corresponding portions of said frame, and the lower portion of the plate holder
25 is provided with a piston which works in the horizontal cylinder. The rear extremities of the tubes for liquid are respectively provided with tubular screw-plugs, in which latter fit smaller screw plugs. The small screw plugs are adapted for slight and gradual adjustments of the plate holder, while the tubular screw plugs are used when the adjustment is to be considerable or to be accomplished rapidly.

30 By turning the screw plugs inward, the liquid is forced up against the respective pistons of the several cylinders, and the plate holder is correspondingly moved. By turning the screw plugs outward, the gravity of the plate holder frame causes the pistons to move the water from its former position, and the desired adjustment follows.

35 It is obvious that certain relatively distinct parts of the Invention may be employed independently of the other parts. It is also apparent that changes, substitutions, and omissions may be made as regards the detail of the mechanism hereinbefore described, provided the essential features of the said Invention are not departed from.

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SPECIFICATION in pursuance of the conditions of the Letters Patent filed by the said William Robert Lake in the Great Seal Patent Office on the 20th September 1880.

WILLIAM ROBERT LAKE, of the Firm of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London. "IMPROVED APPARATUS FOR FACILITATING THE READING OR EXAMINATION OF MICROSCOPIC PHOTOGRAPHS OF WRITTEN OR PRINTED DOCUMENTS, PICTURES, STATUARY, NATURAL OBJECTS, OR THE LIKE." A communication from abroad by Eusebius J. Molera and John C. Cebrian, both of San Francisco, California, United States of America

This Invention is more especially designed to provide means whereby an observer can easily read or examine matter previously reduced to a microscopical scale by the photographic apparatus described in the Specification of former Letters Patent, No. 1216, bearing date the 20th day of March, A.D. 1880.

The first part of the present improvements relates to the optical construction of a binocular microscope, and also to the plate holder employed in presenting to the objective glass the plate having upon it the reduced matter.

This part of the said Invention consists, first, in the combination with eye lenses and large field lenses of two intermediate prisms located next to the eye lenses, and adapted to bring the two separate images nearer together; secondly, in the combination with a frame in which a plate-holder and its slide are adapted in such a manner as to have independent or joint movement of an enclosing frame in which the said plate-holder frame and its slide are adapted to have independent or joint movement, the said parts being adapted to permit the plate-holder to be adjusted vertically and horizontally by both quick and slow movements.

The second part of the present improvements relates to the means employed in adjusting the holder which maintains in position the plate containing the microscopic matter, and to other features hereinafter described.

This part of the said Invention consists, first, in the combination with one or more light-condensing lenses and a plate-holder of one or more microscopic lenses and a transparent screen, the said parts being enclosed in a tubular case and provided with a screw shaft extending rearward, whereby the observer may adjust the plate-holder relatively to the microscopic lens; secondly, in the combination with one or more light condensing lenses, a plate holder, and one or more microscopic lenses, of a transparent screen and a magnifying lens, the said parts being connected and enclosed in a tubular case; thirdly, in the combination with two tubes adapted to be filled with liquid, and provided with upright cylinders, a horizontal cylinder connected with one of the said tubes, and devices for adjusting the liquid in the tubes, of a frame having depending pistons which work in the upright cylinders, and a plate-holder having sliding movement in the said frame, and provided with a piston which works in the horizontal cylinder; fourthly, in the combination with a vertically adjustable frame, having a horizontal cylinder and a plate-holder provided with a piston working in the cylinder, of a tube adapted to be filled with a liquid, a liquid adjusting device, and a flexible pipe which connects the said tube with the cylinder; fifthly, in the combination with two tubes adapted to be filled with liquid, and having upright cylinders and a plate-holder frame provided with depending pistons which work in the cylinders, of tubular screw plugs fitted in the said tubes, and small screw-plugs fitted in the tubular screw plugs, whereby the liquid in the tubes may be adjusted quickly or slowly.

In the accompanying Drawing,—

Figure 1 is a central horizontal section of one form of microscope embodying this Invention, and

Figure 2 represents a modified form of the said microscope.

Figure 3 is a detail perspective view of the plate-holder.

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Figure 4 is a central vertical section of one form of apparatus embodying this Invention, and

Figure 5 represents a modified form of the said apparatus.

Figure 6 is a detail view, partly in elevation and partly in section, of the mechanism for adjusting the plate-holder.

Figure 7 is a view, partly in plan and partly in horizontal section, of the said mechanism.

Figure 8 is a detail perspective view of the heliostat used in the apparatus shewn in Figure 5.

10 Referring to Figures 1, 2, and 3 of the Drawing, the two field lenses A and the two eye lenses B are made of large diameter and with comparatively short focal distances; their distance from the objective glass C is such as to cause a large field of vision. The large size of the field lenses has the effect of forming two separate images at such a distance apart from each other that it is impossible to
15 simultaneously view the objects with both eyes. I therefore place the two prisms between the object lenses and eye lenses and near to the latter. Each prism inclines laterally inward from its end nearest the field lens to its end nearest the eye lens, so that the pencils of light which come from the field lens strike the outer side of the prism and are deflected inwardly against the opposite side of the latter,
20 and are thus brought in line with the eye lens. In this manner the two separate images are brought sufficiently near together to permit the observer to simultaneously use both eyes. This part of the said Invention is represented in the first two Figures of the Drawing as embodied in two different forms of microscope. These views, however, merely illustrate the principle of this improvement in these
25 microscopes, and it is obvious that any change or omission of parts may be made, provided the essential features of the Invention are employed.

The plate-holder E is adapted to have sliding movement in a frame F, either independently of or jointly with its slide G, the latter being moved by a screw-thread on the shaft H, which permits the slide to be adjusted to and fro as desired.
30 This plate-holder frame is itself provided with a slide L, and is adapted to be moved in an enclosing frame M either independently of or jointly with its slide. A shaft N has screw-threaded engagement with this latter slide. It is apparent that by taking hold of the frame F with his hand the observer may quickly adjust the plate-holder vertically. If a slow vertical adjustment is desired it is obtained
35 by operating the shaft N, which moves the slide L carrying this frame F up and down in the frame M. If a quick horizontal adjustment of the plate-holder is desired, the latter may be moved by hand to any desired point in the frame F. If however a slow horizontal movement is desired the observer operates the shaft H, and the slide G carrying the plate holder is correspondingly moved. It is thus
40 apparent that the plate-holder may be adjusted vertically and horizontally by both quick and slow movements.

Referring to Figures 4 and 5 the transparent plate which contains the microscopic matter is placed in the plate-holder A. The light from any suitable source, and condensed by a proper deflector and one or more condensing lenses B, passes
45 through this plate, and the pencils of light from the latter pass through one or more microscopic lenses C. An enlarged image is thereby projected on a transparent screen D, and the said image is still further enlarged by one or more magnifying lenses E. A tubular casing F, either rigid or elastic, encloses the several parts of the instrument, and protects them from exposure to exterior light,
50 so that the image on the screen may be plainly seen. The observer is able to read the plate without placing his eyes close to the instrument, and without being obliged to look through a small hole or holes. In fact it is not necessary to employ any lens E, and where it is omitted the observer looks directly at the transparent screen. An instrument of this construction is shewn in Figure 5, together with a
55 modified form of light condensing apparatus, the heliostat G being provided with means which adapt it to be operated from the observer's seat.

When the plate is not transparent the light and light condensing apparatus have

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to be placed in front of the plate-holder. In some cases natural daylight will be sufficient, and the light condensing apparatus may be suppressed. When however an electric light H is used the same may be connected with an electric machine L operated by a driving wheel M, which latter is actuated by the feet of the observer. The plate-holder is adapted to be adjusted relatively to the microscope lens or lenses 5 by a screw shaft N which extends rearward to be operated from the observer's stand. The plate-holder is also adapted to be operated by the observer without leaving his position, and two rates of movement are provided for, one being for a quick and the other for a slow adjustment of the plate-holder. Two tubes P, P, adapted to be filled with liquid extend lengthwise of the instrument, and have 10 their forward portions formed as upright cylinders *a*. In the latter work pistons *b* which depend from a vertical frame R, the lower longitudinal portion of which is formed with a horizontal cylinder *c*. This cylinder is connected with one of the tubes by a flexible pipe *d*, which permits of the independent vertical adjustment of the frame supporting the plate-holder. The upper and lower portions of this plate- 15 holder slide in grooved ways formed in the corresponding portions of the said frame, and the lower portion of the plate-holder is provided with a piston *f* which works in the horizontal cylinder. The rear extremities of the tubes for containing the liquid are respectively provided with tubular screw-plugs *g*, in which latter fit smaller screw-plugs *h*. The small screw-plugs are adapted for slight and gradual 20 adjustment of the plate-holder, while the tubular screw-plugs are used when the adjustment is to be considerable or to be accomplished rapidly. By turning the screw-plugs inward the liquid is forced up against the respective pistons of the several cylinders, and the plate-holder is correspondingly moved. By turning the screw-plugs outward the gravity of the plate-holder frame causes the pistons 25 to move the water from its former position, and the desired adjustment follows.

In the preceding description I have shewn a complete apparatus embodying all specific elements necessary to illustrate the aforesaid improvements.

It is obvious however that certain relatively distinct parts of the Invention may be employed independently of the other parts. It is also apparent that changes, 30 substitutions, and omissions may be made as regards the details of the mechanism hereinbefore described, provided the essential features of the said Invention are not departed from.

Having thus fully described the said Invention as communicated to me by my foreign correspondents, and the manner of performing the same, I wish it under- 35 stood that I claim,—

First. In a binocular microscope the combination with eye-lenses and large field lenses of two intermediate prisms located next to the eye lenses, and adapted to bring the two separate images nearer together, substantially as above set forth.

Second. The combination with a frame in which a plate holder and its slide are 40 adapted to have independent or joint movement of an enclosing frame in which the said plate-holder frame and its slide are adapted to have independent or joint movement, these parts being adapted to permit the plate-holder to be adjusted vertically and horizontally by both quick and slow movements, substantially as set forth. 45

Third. The combination with one or more condensing lenses and a plate-holder of one or more microscopic lenses and a transparent screen, these parts being enclosed in a tubular case, and provided with a screw shaft extending rearward, whereby the observer may adjust the plate-holder relatively to the microscopic lens, 50 substantially as above set forth.

Fourth. The combination with one or more light condensing lenses, a plate-holder, and one or more microscopic lenses, of a transparent screen and a magnifying lens, these parts being connected and enclosed in a tubular case, substantially as herein set forth.

Fifth. The combination with two tubes adapted to be filled with liquid, and 55 provided with upright cylinders, a horizontal cylinder connected with one of the said tubes, and devices for adjusting the liquid in the tubes, of a frame having

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depending pistons which work in the upright cylinders, and a plate-holder having sliding movement in the said frame, and provided with a piston which works in the horizontal cylinder, substantially as above set forth.

5 Sixth. The combination with a vertically adjustable frame having a horizontal cylinder, and a plate-holder provided with a piston working in the cylinder, of a tube adapted to be filled with liquid, a liquid adjusting device, and a flexible pipe which connects the said tube with the cylinder, substantially as above set forth.

10 Seventh. The combination with two tubes adapted to be filled with liquid, and having upright cylinders, and a plate-holder frame provided with dependent pistons which work in the said cylinders, of tubular screw-plugs fitted in the said tubes, and small screw-plugs fitted in the tubular screw-plugs, whereby the liquid in the tubes may be adjusted quickly or slowly, substantially as above set forth.

15 In witness whereof, I, the said William Robert Lake, have hereunto set my hand and seal, this Twentieth day of September, in the year of our Lord One thousand eight hundred and eighty.

WM. ROBT. LAKE. (L.S.)

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